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### A METHOD OF DISTRIBUTING FERTILISERS IN BULK

by: E. E. Bragg, B.Sc.(Agric.),  
M.Sc.(Agri.Eng.), A.M.I.Ag.E.

Scottish Agricultural Industries Ltd.

#### 1. INTRODUCTION

In the face of a constantly decreasing labour force on the land and the loss of valuable acres to urban developments, advances in mechanisation have played an important role in maintaining a steady annual rise in agricultural production. Such advances, however, might well have proved more of a handicap than a help to smaller farmers had it not been for a simultaneous expansion of agricultural contracting services, which have placed labour-saving machinery of high capital cost within the reach of all. If the factor of high capital expenditure could be ignored, there would still remain the problem of training and keeping in practice an operator on a machine which may be used for as little as one day per year. There are farms where the provision of such an operator would be a difficulty, the working time of the farm staff being already fully taken up with the regular day-to-day tasks of milking, feeding and bedding livestock, whilst the prospect of taking on additional labour may also be uninviting either from the point of view of the quality available, or the impossibility of keeping another worker fully occupied throughout the year. Contracting services can, therefore, play an important part in increasing the production from our farms.

#### 2. FARM CONTRACT SERVICE

A criticism sometimes levelled at the principle of contracting services is the difficulty of satisfying a large number of customers at periods of peak demand, but whilst this may be true of certain operations, the use of relatively expensive equipment capable of high rates of work can be justified on contract operations especially when the effective season is lengthened by careful routing from the early farms to the later. In Scotland, owing to the nature of the country, a distance of as little as 15 miles may mean a difference of up to three weeks in the commencement of the growing season.

Experience gained in bulk contract lime spreading led, quite logically, to a demand that similar techniques should be applied to the handling and spreading of fertiliser. At first sight, there would appear to be no need for any alteration in methods; a closer

inspection of the problem will reveal, however, that fertiliser spreading demands a different and more cautious approach. Recently, after an intensive study of the requirements, a large scale fertiliser spreading service has been introduced in Scotland, the aim being to deliver and spread fertilisers mainly on grassland, efficiently and at a very economic rate, due to improved handling methods. By employing specialised equipment one operator can spread fertiliser on upwards of 80 acres in a day at a cost to the farmer well below that at which he could achieve the same end. Apart from this, there is the added advantage that the farm staff are free to proceed with other work, a point of special significance in the spring season.

### 3.1. REQUIREMENTS FOR A FERTILISER SPREADING SERVICE

Requirements in the design of equipment for the service may be summarised thus:-

- (i) Time-consuming bag handling must be eliminated.
- (ii) Owing to the low rates of application as compared to line spreading, the fertiliser must be off-loaded on arrival at the farm so that lorries are not held waiting whilst a consignment is spread.
- (iii) Transport to the farm in the interests of economy must avoid the use of expensive unloading gear, so that at times of peak demand this aspect will not be limited by the number of specialised lorries available.
- (iv) The fertiliser must be protected so that if spreading is delayed due to bad weather, the fertiliser can be left on the farm for several days without deterioration.
- (v) The spreading must be even and accurate at the low rates per acre applied, yet at the same time the machine must be capable of covering large acreages in a day.

### 3.2. METHODS ADOPTED

#### 3.2.1. Container

After considering many alternative schemes, it was decided that the requirements related to the transport and loading of fertiliser would best be met by using containers which could be carried on any standard flat lorry, as the majority of the existing fleet consisted of this type. The capacity of each container is two tons of granular fertiliser, a figure which was dictated by consideration of the most usual sizes of order, and here it was felt that multiples of two tons would be most convenient having regard to the range of fertilisers offered. This two ton module has in practice proved to be quite acceptable and satisfactory.

Some of the difficulties to be overcome in the design will be appreciated when it is realised that means had to be devised whereby the lorry driver, without outside assistance or any special equipment other than the usual lorry tool-kit, should be able to unload over two tons in little more than the same number of minutes. For obvious reasons the tare weight of the container and supporting structures had to be kept to a minimum, whilst further limitations were imposed by restrictions on the overall dimensions to comply with legal requirements governing road transport, clearances for filling arrangements at the factories, as well as the more obvious limits set by farm gateways, bridges, etc.

The present design of container which is protected by patent rights, relies upon the principle that once the fertiliser is loaded, gravity should do the rest and fill the spreader. In practice, this is achieved by using the hydraulic jack from the lorry tool-kit to raise each end of the container in turn a matter of two inches or so. Whilst the end of the container is in the raised position, tubular steel legs can be positioned so that on lowering the jack the container is supported by the legs from the ground at approximately the same height as it was when carried on the lorry. The legs are double-ended so that they serve as supports for both transport and unloaded positions. The containers are arranged to protect the contents from the weather, a close-fitting rubber cover is fitted to the top filling aperture. When in the unloaded position, there is ample room to reverse a trailer type spreader beneath the bottom outlet which is provided with a sliding shutter, operation of which allows a load of from 20 to 30 cwts. to be discharged to the spreader in under a minute.

By utilising containers of this type a lorry load of 8 tons of fertiliser, sufficient for about half a day's work, can be delivered to a farm before the spreader arrives. The load may comprise up to four different types of fertiliser or consignments for more than one farm, each being individually weighed and checked on loading. Whilst spreading is proceeding at one farm, the lorry will already be proceeding to the next farm or farms with a further load, timing being arranged so that it can then uplift the empty containers from the first farm for refilling at the factory. In practice, it has been found that a maximum radius of 30/40 miles from the filling point gives the most effective use of containers, enabling the lorry to complete two and occasionally three deliveries per day.

### 3.2.2. Filling Containers

In order to ensure a rapid turn-round of containers and lorries, special arrangements have had to be made at filling points so that loading can be effected with the minimum of delay. This has involved the erection of overhead hoppers with discharge via batch weighers, giving sufficient headroom for the containers to be loaded without being removed from the lorry.

### 3.2.3. Spreading Equipment

Turning to the final requirement enumerated earlier, demanding a high degree of evenness and accuracy in the actual spreading from a machine capable of a high rate of work; a survey of the types currently available showed that no one machine was wholly satisfactory. Utilising one of the more promising existing machines as the basis, development work commenced which ultimately resulted in a tractor drawn spreader having a capacity of up to 28 cwts. and capable of an effective spread of 36 feet with a variation of only  $\pm 10\%$  in transverse distribution.

Incorporated in the design are a number of features which have been found desirable in field work. These include extra large tyres to reduce ground pressure, this is of special importance when operating on young grass in the early spring; constant speed spinning distributing discs which give a fixed spreading width; a feed mechanism which is landwheel driven, thus avoiding the variations in spreading rate which occur with power take-off driven types of machines.

Using machines of this type a skilled operator usually spreads between 500 and 600 tons of granular fertiliser in a 10 week spring season from say, late February until early May, covering approximately 3,500-4,000 acres. Spreading is, of course, carried out in the early summer although not on the same intensive scale,

being mainly concentrated on silage and hay aftermath. A higher level of activity commences again in the autumn, continuing as long as weather conditions allow and frequently extending the season until Christmas with the spreading of Potassic Superphosphate in addition to the usual range of N.P.K. compounds.

#### 4. CONCLUSION

From the foregoing, it may be appreciated that by careful organisation and improved handling methods, spreading can be offered at a charge to the farmer of only a few shillings per acre more than if the fertilisers were delivered to the farm in bags, the cost being considerably less than that involved in operating the farmer's own tractor and distributor. In addition, the added cost and complication of loading trailers with bags, taking them to the field, and possibly providing an additional worker to assist with the unloading into the distributor is avoided.

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